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In the Neighborhood of 18 Million: Estimating How Many People Live Near Oil and Gas Wells

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Public concern over potential health risks related to oil and gas wells has spurred researchers to quantify how many people live near these facilities, in what are known as proximity studies.[1,2,3] A new study in *Environmental Health Perspectives* provides an updated estimate of how many Americans live within a mile of oil or gas development, as well as guidelines for designing future proximity studies.[4]

"From a population health perspective, we want to know [how many people] might be in a circumstance where their health could be compromised by a given set of exposures," says senior study author Seth Shonkoff, who is executive director of PSE Healthy Energy, an energy science and policy institute. PSE Healthy Energy associate researcher Eliza Czolowski led the study.

Many recent studies have focused on the health impacts of unconventional wells, namely, those that use hydraulic fracturing (fracking) to extract oil and natural gas.[5] This is due in large part to dramatic increases in fracking over the past decade in places like Pennsylvania and Ohio, say the researchers. Unconventional development typically features clusters of multiple wells on one pad, whereas conventional oil and gas wells typically are more spread out. Both conventional and unconventional wells emit hazardous air pollutants—some that are naturally occurring and some that are added to the wells during operation.[4]

Several preliminary studies have reported associations between living close to an unconventional gas well and adverse health effects.[5,6] These include a higher rate of preterm births,[7] certain birth defects,[8] and an increase in general health complaints, such as fatigue, headaches, and respiratory symptoms.[9,10,11] One study that assessed proximity to gas and oil wells found an association with childhood hematological cancers.[12]

In this study, Czolowski's team examined residential proximity to both conventional and unconventional oil and gas wells. They limited their analysis to wells that were confirmed as active at the time of the study. Data on the location and status of oil and gas wells in 30 states came from state regulatory databases and an oil and gas industry database called DrillingInfo, which consolidates data from regulatory agencies in a more study-ready format. Their final analysis included 808,485 active wells, with conventional wells comprising nearly 90%.

Using data from the U.S. Census Bureau, the researchers estimated that 17.6 million people lived within 1 mile of an active well as of 2010. That's roughly 6% of the population of the contiguous United States. This number includes 1.4 million young children, 1.1 million elderly people, 2.9 million Hispanic

The Marcellus and Utica shale plays running beneath southeastern Ohio, where this community is located, make the state the seventh top U.S. state in gas production.[17] The remainder of the top 10 producers include Texas, Pennsylvania, Oklahoma, Louisiana, Colorado, Wyoming, West Virginia, New Mexico, and Arkansas. Image: © Elise Elliott/Yale University.

individuals, and 6.4 million non-Hispanic minority individuals. Ohio, West Virginia, and Oklahoma led the states in terms of percentage of their populations living near active wells, while Texas had the greatest number of people—4.5 million—living within a 1-mile buffer zone.

After reviewing previously published analyses, the researchers concluded that studies focused mainly on proximity to unconventional wells may have underestimated how many people are at risk for oil and gas development–related exposures. For example, some studies did not include proximity to conventional wells, even though they, too, emit toxic air pollutants. Other studies may have overestimated risks by including wells that had been drilled but were not currently producing oil or gas. Most notably, a 2013 *Wall Street Journal* report[13] estimated more than three times the population living within a mile of unconventional oil and gas development across the top 11 producing states as the current study.

The researchers recommend that future proximity studies of human health risks from oil and gas development include both conventional and unconventional well locations, parse potential differences among exposure risks associated with different types of wells (for instance, oil vs. gas), and confirm that wells are active. The latter also begs the question of considering how to incorporate potential exposures from abandoned wells, which may or may not be plugged.

"The study provides useful demographic information that may aid researchers and even policy makers in setting priorities for future studies and risk assessments," says Nicole Deziel, an exposure scientist at Yale University who was not involved in the study. She says a few groups are already conducting research consistent with the study recommendations. For instance, studies of prenatal and childhood health outcomes in Colorado have estimated risk associated with proximity to both oil and gas development and to conventional and unconventional wells.[8,12,14] Other groups have developed sophisticated proximity models that incorporate both phase and duration of well-development activities.[7,10,11,15]

Deziel adds that some of the study authors' recommendations may not be suitable across all assessments. For example, while it is true that both conventional and unconventional wells may present health risks, unconventional extraction activities may pose some unique threats to nearby communities, such as potential water contamination due to the vast amounts of wastewater generated.[16] Therefore, she says, some hypothesis-driven researchers may want to target fracking wells specifically. As for the public, many Americans may not even be aware that they live near active oil or gas wells. Shonkoff says PSE Healthy Energy currently is working to make their proximity data available to the public in the form of a searchable database pending the availability of future funding.

Lindsey Konkel is a New Jersey–based journalist who reports on science, health, and the environment.

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